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10/684,522	10/15/2003	Young-Dong Lee	030681-578	4190

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ALEJANDRO MULERO, LUZ L	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/684,522	LEE ET AL.	
	Examiner	Art Unit	
	Luz L. Alejandro	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 March 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,9-21 and 25-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 9-21, 25-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 1, 9-11, 13-14, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., US 6,288,493 or JP 2001-085196 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646.

Lee et al. shows the invention substantially as claimed including an inductively coupled plasma generating apparatus comprising: an evacuated reaction chamber; an antenna 100' installed at an upper portion of the reaction chamber to induce an electric field for ionizing reaction gas supplied into the reaction chamber and generating plasma;

and a radio frequency power source 102' connected to the antenna to apply radio frequency power to the antenna; wherein the antenna comprises a plurality of coils comprising an open ended first continuous serpentine coil 310b, an open ended second continuous circular coil 310c, and an open ended third continuous serpentine coil 310a surrounding the first continuous serpentine coil, and the first serpentine coil does not overlap or cross any portion of the third serpentine coil (see, for example, figs. 1 and 3b, and their descriptions).

Lee et al. does not expressly disclose wherein the first and third serpentine coils are bent in a zigzag pattern, wherein the first and third serpentine coils comprise an outer loop, an inner loop, and connecting portions between the outer loop and the inner loop, wherein the outer loop of the first serpentine coil and the outer loop of the third serpentine coil are approximately parallel, the inner loop of the first serpentine coil and the inner loop of the third serpentine coils are approximately parallel, the connecting portions of the first serpentine coil are approximately parallel to the connecting portions of the third serpentine coil and are longer than the connecting portions of the third serpentine coil. Wang et al. disclose an inductive coupled plasma apparatus in which a serpentine coil is bent is a zigzag pattern (see, for example, figs. 1-2, 5-10, and their descriptions). Additionally, Okumura et al. disclose an inductive coupled plasma apparatus in which a serpentine coil is bent is a zigzag pattern (see, for example, figs. 3, 14-16 and 21, and their descriptions). Therefore, in view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Lee et al. as to comprise the claimed coil zigzag

shape structure because such coil configuration is used and known to be suitable for generating uniform plasma in an inductive plasma apparatus. Furthermore, the configuration of the claimed coils is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed coils is significant.

With respect to claims 9-11 and 27, note in the apparatus of Lee et al. modified by Wang et al. or Okumura et al., the serpentine coil of has a zigzag pattern with equally spaced several sections, the serpentine coil has a plurality of outer portions extending along the circumference and a plurality of inner portions bent toward the center portion, and the serpentine coil is connected to the RF power source at the end away from the circular continuous second portion and the circular continuous second portion is connected to ground at the end away from the serpentine continuous first portion. Furthermore, the inner and outer portions of the serpentine coil are arranged to correspond to center and edge portions of the chamber, respectively.

With respect to claims 13-14, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Lee et al. as to have the coil in the desired shape because the configuration of the claimed coils is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed coils is significant.

Claims 2-3, 12 and 25-26, 28-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., US 6,288,493 or JP 2001-085196 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646, as applied to claims 1, 9-11, 13-14, and 27 above, and further in view of Howald et al., US 6,842,147.

The apparatus of Lee et al. modified by Wang et al. or Okumura et al. comprises a circular coil arranged at a center portion of the antenna, the first serpentine coil arranged around, the third serpentine coil shaped to nest around and outline the first serpentine coil, and wherein the circular coil has a relative small radius. However, Lee et al., Wang et al. or Okumura et al. do not disclose the the first serpentine coil is connected to the circular coil. Howald et al. discloses an inductively plasma apparatus in which antenna comprising first coil 232, second coil 228 and third coil 234 and wherein first coil 232 is connected to second coil 228 (see, for example, figs. 1 and 3, and their descriptions). Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Lee et al. modified by Wang et al. or Okumura et al. as to connect the first and second coils as to provide a single current path such that the current flows in the same sense within the plane of the antenna.

Claims 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., US 6,288,493 or JP 2001-085196 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646, as applied to claims 1, 9-11, 13-14, and 27 above,

and further in view of Hemker et al., US 2004/0011467 or Bailey, III et al., US 2003/0010454.

Lee et al., Wang et al. and Okumura et al. are applied as above but do not expressly disclose the claimed magnetic configuration. Hemker et al. discloses a plurality of permanent magnets 132 arranged around the outer wall of the reaction chamber, wherein their north and south poles alternate, they are arranged in a region where the magnitude of a magnetic field generated by the antenna is relatively weak, and the magnets can revolve simultaneously about a central axis of the reaction chamber to shift their positions (see figs. 1-6c and their descriptions). Alternatively, Bailey, III et al. also discloses the claimed structure (see figs. 2, 3A-4, and 6 and their descriptions). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Lee et al. modified by Wang et al. or Okumura et al. so as to comprise the magnet revolving structure of Hemker et al. or Bailey, III et al. because such a magnetic configuration allows for modification of the plasma as well as allowing the plasma to be better confined to the processing region.

Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., US 6,288,493 or JP 2001-085196 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646, as applied to claims 1, 9-11, 13-14, and 27 above, and further in view of Kwon et al., U.S. Patent 6,653,988 or Chen et al., US 6,164,241.

Lee et al., Wang et al. or Okumura et al. are applied as above but do not expressly disclose a matching network connected between the radio frequency power source and the antenna and a capacitor connected between the matching network and the antenna, in parallel with the antenna, wherein the plurality of coils are connected in series to the radio frequency power source, and wherein at least one of the coils is connected in parallel to the RF source. Kwon et al. discloses a capacitor C3 connected between a matching network 120 and the antenna, in parallel with the other branch from the power supply connecting with the antenna, wherein the plurality of coils are connected in series to the radio frequency power source 110, and wherein at least one of the coils is connected in parallel to the RF source (see fig. 2a and its description). Furthermore, Chen et al. discloses a matching network 320 connected between a radio frequency power source 310 and the antenna 1 and a capacitor C1 connected between the matching network and the antenna, in parallel with the antenna, wherein the plurality of coils are connected in series to the radio frequency power source, and wherein at least one of the coils is connected in parallel to the RF source (see, for example, fig. 3 and its description. Therefore, in view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Lee et al. modified by Wang et al. or Okumura et al. so as to comprise the matching network/rf power source/capacitor/antenna structure of Kwon et al. or Chen et al. because in such a way a suitable parallel resonance antenna can be operated.

Claim 1, 9-11, 13-14, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda et al., US 2006/0027168 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646.

Matsuda et al. shows the invention substantially as claimed including an inductively coupled plasma generating apparatus comprising: an evacuated reaction chamber; an antenna 01/1 installed at an upper portion of the reaction chamber to induce an electric field for ionizing reaction gas supplied into the reaction chamber and generating plasma; and a radio frequency power source connected to the antenna to apply radio frequency power to the antenna; wherein the antenna comprises a plurality of coils comprising an open ended first continuous serpentine coil 01b/1b, an open ended second continuous circular coil 01c/1c, and an open ended third continuous serpentine coil 01a/1a surrounding the first continuous serpentine coil, and the first serpentine coil does not overlap or cross any portion of the third serpentine coil (see, for example, figs. 1 and 3b, and their descriptions).

Matsuda et al. does not expressly disclose wherein the first and third serpentine coils are bent in a zigzag pattern, wherein the first and third serpentine coils comprise an outer loop, an inner loop, and connecting portions between the outer loop and the inner loop, wherein the outer loop of the first serpentine coil and the outer loop of the third serpentine coil are approximately parallel, the inner loop of the first serpentine coil and the inner loop of the third serpentine coils are approximately parallel, the connecting portions of the first serpentine coil are approximately parallel to the connecting portions of the third serpentine coil and are longer than the connecting

portions of the third serpentine coil. Wang et al. disclose an inductive coupled plasma apparatus in which a serpentine coil is bent is a zigzag pattern (see, for example, figs. 1-2, 5-10, and their descriptions). Additionally, Okumura et al. disclose an inductive coupled plasma apparatus in which a serpentine coil is bent is a zigzag pattern (see, for example, figs. 3, 14-16 and 21, and their descriptions). Therefore, in view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Matsuda et al. as to comprise the claimed coil zigzag shape structure because such coil configuration is used and known to be suitable for generating uniform plasma in an inductive plasma apparatus. Furthermore, the configuration of the claimed coils is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed coils is significant.

With respect to claims 9-11 and 27, note in the apparatus of Matsuda et al. modified by Wang et al. or Okumura et al., the serpentine coil of has a zigzag pattern with equally spaced several sections, the serpentine coil has a plurality of outer portions extending along the circumference and a plurality of inner portions bent toward the center portion, and the serpentine coil is connected to the RF power source at the end away from the circular continuous second portion and the circular continuous second portion is connected to ground at the end away from the serpentine continuous first portion. Furthermore, the inner and outer portions of the serpentine coil are arranged to correspond to center and edge portions of the chamber, respectively.

With respect to claims 13-14, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Matsuda et al. as to have the coil in the desired shape because the configuration of the claimed coils is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed coils is significant.

Claims 2-3, 12 and 25-26, 28-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda et al., US 2006/0027168 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646, as applied to claims 1, 9-11, 13-14, and 27 above, and further in view of Howald et al., US 6,842,147.

The apparatus of Matsuda et al. modified by Wang et al. or Okumura et al. comprises a circular coil arranged at a center portion of the antenna, the first serpentine coil arranged around, the third serpentine coil shaped to nest around and outline the first serpentine coil, and wherein the circular coil has a relative small radius. However, Matsuda et al., Wang et al. or Okumura et al. do not disclose the the first serpentine coil is connected to the circular coil. Howald et al. discloses an inductively plasma apparatus in which antenna comprising first coil 232, second coil 228 and third coil 234 and wherein first coil 232 is connected to second coil 228 (see, for example, figs. 1 and 3, and their descriptions). Therefore, in view of this disclosure, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Matsuda et al. modified by Wang et al. or Okumura et al. as to

connect the first and second coils as to provide a single current path such that the current flows in the same sense within the plane of the antenna.

Claims 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda et al., US 2006/0027168 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646, as applied to claims 1, 9-11, 13-14, and 27 above, and further in view of Hemker et al., US 2004/0011467 or Bailey, III et al., US 2003/0010454.

Matsuda et al., Wang et al. and Okumura et al. are applied as above but do not expressly disclose the claimed magnetic configuration. Hemker et al. discloses a plurality of permanent magnets 132 arranged around the outer wall of the reaction chamber, wherein their north and south poles alternate, they are arranged in a region where the magnitude of a magnetic field generated by the antenna is relatively weak, and the magnets can revolve simultaneously about a central axis of the reaction chamber to shift their positions (see figs. 1-6c and their descriptions). Alternatively, Bailey, III et al. also discloses the claimed structure (see figs. 2, 3A-4, and 6 and their descriptions). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Matsuda et al. modified by Wang et al. or Okumura et al. so as to comprise the magnet revolving structure of Hemker et al. or Bailey, III et al. because such a magnetic configuration allows for modification of the plasma as well as allowing the plasma to be better confined to the processing region.

Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuda et al., US 2006/0027168 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646, as applied to claims 1, 9-11, 13-14, and 27 above, and further in view of Kwon et al., U.S. Patent 6,653,988 or Chen et al., US 6,164,241.

Matsuda et al., Wang et al. or Okumura et al. are applied as above but do not expressly disclose a matching network connected between the radio frequency power source and the antenna and a capacitor connected between the matching network and the antenna, in parallel with the antenna, wherein the plurality of coils are connected in series to the radio frequency power source, and wherein at least one of the coils is connected in parallel to the RF source. Kwon et al. discloses a capacitor C3 connected between a matching network 120 and the antenna, in parallel with the other branch from the power supply connecting with the antenna, wherein the plurality of coils are connected in series to the radio frequency power source 110, and wherein at least one of the coils is connected in parallel to the RF source (see fig. 2a and its description). Furthermore, Chen et al. discloses a matching network 320 connected between a radio frequency power source 310 and the antenna 1 and a capacitor C1 connected between the matching network and the antenna, in parallel with the antenna, wherein the plurality of coils are connected in series to the radio frequency power source, and wherein at least one of the coils is connected in parallel to the RF source (see, for example, fig. 3 and its description. Therefore, in view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Matsuda et al. modified by Wang et al. or Okumura et al. so as to comprise

the matching network/rf power source/capacitor/antenna structure of Kwon et al. or Chen et al. because in such a way a suitable parallel resonance antenna can be operated.

Claim 1, 9-11, 13-14, 27-28, 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howald et al., US 6,842,147 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646.

Howald et al. shows the invention substantially as claimed including an inductively coupled plasma generating apparatus 200 comprising: an evacuated reaction chamber 202; an antenna 210 installed at an upper portion of the reaction chamber to induce an electric field for ionizing reaction gas supplied into the reaction chamber and generating plasma; and a radio frequency power source 214 connected to the antenna to apply radio frequency power to the antenna; wherein the antenna comprises a plurality of coils comprising an open ended first continuous serpentine coil 232, an open ended second continuous circular coil 228, and an open ended third continuous serpentine coil 234 surrounding the first continuous serpentine coil, and the first serpentine coil does not overlap or cross any portion of the third serpentine coil (see, for example, figs. 2-3 and 8, and their descriptions).

Howald et al. does not expressly disclose wherein the first and third serpentine coils are bent in a zigzag pattern, wherein the first and third serpentine coils comprise an outer loop, an inner loop, and connecting portions between the outer loop and the inner loop, wherein the outer loop of the first serpentine coil and the outer loop of the

third serpentine coil are approximately parallel, the inner loop of the first serpentine coil and the inner loop of the third serpentine coils are approximately parallel, the connecting portions of the first serpentine coil are approximately parallel to the connecting portions of the third serpentine coil and are longer than the connecting portions of the third serpentine coil. However, note that Howald et al. clearly discloses that the shape of the rf electromagnetic field distribution within the plasma processing chamber can be modified depending on the shape of the coils (see, for example, col. 9-line 55 to col. 10-line 2), and therefore, a prima facie case of obviousness still exists because it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the shape of the coil during routine experimentation depending upon, for example, the desired rf electromagnetic field distribution, and would not lend patentability to the instant application absent the showing of unexpected results. Moreover, the configuration of the claimed coils is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed coils is significant. Additionally, Wang et al. disclose an inductive coupled plasma apparatus in which a serpentine coil is bent is a zigzag pattern (see, for example, figs. 1-2, 5-10, and their descriptions). Additionally, Okumura et al. disclose an inductive coupled plasma apparatus in which a serpentine coil is bent is a zigzag pattern (see, for example, figs. 3, 14-16 and 21, and their descriptions). Therefore, in view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Howald et al. as to comprise the claimed coil zigzag shape structure

because such coil configuration is used and known to be suitable for generating uniform plasma in an inductive plasma apparatus.

With respect to claims 9-11 and 27, note in the apparatus of Howald et al. modified by Wang et al. or Okumura et al., the serpentine coil of has a zigzag pattern with equally spaced several sections, the serpentine coil has a plurality of outer portions extending along the circumference and a plurality of inner portions bent toward the center portion, and the serpentine coil is connected to the RF power source at the end away from the circular continuous second portion and the circular continuous second portion is connected to ground at the end away from the serpentine continuous first portion. Furthermore, the inner and outer portions of the serpentine coil are arranged to correspond to center and edge portions of the chamber, respectively.

With respect to claims 13-14, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Howald et al. as to have the coil in the desired shape because the configuration of the claimed coils is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed coils is significant.

Claims 2-3, 12, 25-26, 29 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howald et al., US 6,842,147 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646, as applied to claims 1, 9-11, 13-14, 27-

28, 30-31 above, and further in view of Lee et al., US 6,288,493 or JP 2001-085196, or Matsuda et al., US 2006/0027168.

Howald et al. does not expressly disclose the claimed coils configuration, however, Howald et al. further discloses that the shape of the rf electromagnetic field distribution within the plasma processing chamber can be modified depending on the location of the coils (see, for example, col. 9- line 55 to col. 10-line 2) and therefore, a prima facie case of obviousness still exists because it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the location of the coil during routine experimentation depending upon, for example, the desired rf electromagnetic field distribution, and would not lend patentability to the instant application absent the showing of unexpected results. Moreover, the configuration of the claimed coils is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed coils is significant. Additionally, Wang et al. discloses an inductive plasma apparatus comprising a first serpentine circular coil 920, a second serpentine coil 930 and a third serpentine coil 910, wherein the circular coil is arranged at a center portion of the antenna and the serpentine coils 920 and 930 are arranged around; wherein the first, second and third coils are concentric (see, for example, figs. 1-2, 5-10, and their descriptions). Also, Lee et al. discloses an inductive plasma apparatus comprising a first serpentine coil 310b, a second serpentine coil 310c, and a third serpentine coil 310a, wherein the second serpentine coil is arranged at a center portion of the antenna and the first and third serpentine coils are arranged around; and wherein the first,

second and third coils are concentric (see, for example, figs. 1 and 3b, and their descriptions). Moreover, Matsuda et al. discloses an inductive plasma apparatus comprising a first serpentine coil 01b/1b, a second serpentine coil 01c/1c, and a third serpentine coil 01a/1a, wherein the second serpentine coil is arranged at a center portion of the antenna and the first and third serpentine coils are arranged around; and wherein the first, second and third coils are concentric (see, for example, figs. 1 and 3b, and their descriptions). Therefore, in view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Howald et al. modified by Wang et al. or Okumura et al., as to comprise the claimed coils configuration because in such a way the antenna can cover a wide area of the processing chamber and therefore large substrates can be uniformly processed. Note that the circular coil of the apparatus of Howald et al. modified by Wang et al. or Okumura and Lee et al. or Matsuda et al., will have a relatively small radius. Also, the plurality of coils of the apparatus of Howald et al. modified by Wang et al. or Okumura et al. and Lee et al. or Matsuda et al. comprise at least one connection coil connecting the first serpentine coil and the circular coil.

Claims 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howald et al., US 6,842,147 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646, as applied to claims 1, 9-11, 13-14, 27-28, 30-31 above, and further in view of Hemker et al., US 2004/0011467 or Bailey, III et al., US 2003/0010454.

Howald et al., Wang et al. and Okumura et al. are applied as above but do not expressly disclose the claimed magnetic configuration. Hemker et al. discloses a plurality of permanent magnets 132 arranged around the outer wall of the reaction chamber, wherein their north and south poles alternate, they are arranged in a region where the magnitude of a magnetic field generated by the antenna is relatively weak, and the magnets can revolve simultaneously about a central axis of the reaction chamber to shift their positions (see figs. 1-6c and their descriptions). Alternatively, Bailey, III et al. also discloses the claimed structure (see figs. 2, 3A-4, and 6 and their descriptions). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Howald et al. modified by Wang et al. or Okumura et al. so as to comprise the magnet revolving structure of Hemker et al. or Bailey, III et al. because such a magnetic configuration allows for modification of the plasma as well as allowing the plasma to be better confined to the processing region.

Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howald et al., US 6,842,147 in view of Wang et al., US 2003/0111181 or Okumura et al., US 6,177,646, as applied to claims 1, 9-11, 13-14, 27-28, 30-31 above, and further in view of Kwon et al., U.S. Patent 6,653,988 or Chen et al., US 6,164,241.

Howald et al., Wang et al. or Okumura et al. are applied as above but do not expressly disclose a matching network connected between the radio frequency power source and the antenna and a capacitor connected between the matching network and

the antenna, in parallel with the antenna, wherein the plurality of coils are connected in series to the radio frequency power source, and wherein at least one of the coils is connected in parallel to the RF source. Kwon et al. discloses a capacitor C3 connected between a matching network 120 and the antenna, in parallel with the other branch from the power supply connecting with the antenna, wherein the plurality of coils are connected in series to the radio frequency power source 110, and wherein at least one of the coils is connected in parallel to the RF source (see fig. 2a and its description). Furthermore, Chen et al. discloses a matching network 320 connected between a radio frequency power source 310 and the antenna 1 and a capacitor C1 connected between the matching network and the antenna, in parallel with the antenna, wherein the plurality of coils are connected in series to the radio frequency power source, and wherein at least one of the coils is connected in parallel to the RF source (see, for example, fig. 3 and its description. Therefore, in view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Howald et al. modified by Wang et al. or Okumura et al. so as to comprise the matching network/rf power source/capacitor/antenna structure of Kwon et al. or Chen et al. because in such a way a suitable parallel resonance antenna can be operated.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 571-272-1430. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Luz L. Alejandro
Primary Examiner
Art Unit 1763

June 25, 2007